

Closeout Report

on the

Director's Review

of

D-Zero Run IIb Detector Upgrade

July 15-16, 2004

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Executive Summary

An executive summary of the D-Zero Run IIb Detector Upgrade Director's Review held July 15-16, 2004 is provided here.

According to the Charge the Committee was to review progress since the last review, installation planned for the 2004 and 2005 shutdowns as well as status and plans for the AFE II (analog front end version II for the central track trigger) system.

Technical

Good progress is being made on the Layer 0 silicon, trigger, and DAQ/Online subprojects. The current status of the AFE II system was presented along with a plan to test the new prototype that is to arrive in September and then decide on how to handle a change request to incorporate AFE II into the baseline. This decision is targeted for January/February 2005. The next Director's Review of D-Zero should perhaps be held at an appropriate time with regard to these developments.

Cost

Cost experience to date is good. Adequate funding has been set aside to implement the AFE II and a healthy contingency on the estimate to complete (77 %) exists.

Schedule

Layer 0 components are ahead of schedule and plans for starting the fabrication at SiDet sooner (about two months sooner) than the baseline schedule have been made. The many trigger components seem to be well in hand and underway to be ready for installation in the FY05 shutdown. Several items are being tested in parallel with physics running in the interim and infrastructure activities in support of the trigger elements are taking place in the FY04 shutdown.

Activities for the FY04 Shutdown have been identified. An opportunity exists in the FY04 shutdown to perform a detailed survey of the component locations bounding the space where Layer 0 will be installed. The committee urges D-Zero seriously consider performing this detailed survey if at all possible and if the risk is justifiable.

The FY05 installation plans were presented. An Installation Manager has been in place for about two years. A detailed Microsoft Project schedule exists for this effort.

The Run IIb Upgrade project is presently on schedule to be ready for the FY05 shutdown. However, it seems prudent for the D-Zero Upgrade project team to maintain close coordination with the Accelerator Division, CDF Upgrade, and Directorate over the coming year so that an overall optimum FY05 shutdown schedule can be arranged.

Management

The component design and installation planning philosophy is to minimize lost beam time, that is to minimize the time between when Physics stops until Physics resumes. This period includes physics commissioning of the upgraded detector. D-Zero has

formed a collaboration wide committee (SP-IPC – Standing Committee on Installation through Physics Commissioning) to examine the full physics commissioning phase. This is viewed as a good move and the SP-IPC is encouraged to address their charge vigorously. This committee should be expanded to include an AFE II group at an appropriate time.

Project management tools are being applied and used in managing the project. The Project Management Team is encouraged to keep the baseline schedule current through appropriate change request actions and keep the current working schedule up to date on a monthly basis.

1.0 Introduction

A Director's Review of the D-Zero Run IIb Detector Upgrade was held on July 15-16, 2004. The Charge for this review is shown in Appendix A. An agenda is given in Appendix B. The members of the Review Committee and their assignments are listed in Appendix C and a list of Review Participants is given in Appendix D.

2.0 Trigger Status and Installation Plans

Trigger and Online

Findings:

- The Trigger Upgrade is designed to improve the purity of the trigger system to allow it to cope with higher luminosity without excessive deadtime and/or pre-scaling.
- The actual numerical gains to be expected - either in total or by each component of the project - were not presented. The topic is complex; the gains from individual items have been presented in previous reviews and the experiment is working to develop simulation tools to allow it to generate a complete trigger list.
- The major hardware components of the trigger upgrade are in order of size of project:
 - complete replacement of the L1 calorimeter trigger - L1Cal
 - replacement of the Digital Front End boards in the L1 Central Track Trigger - L1CTT
 - addition of Calorimeter and Track-Matching capability - L1caltrack
 - the addition of boards into the Silicon Track Trigger for silicon layer 0 - L2STT
 - the replacement of the level 2 cpu's with more powerful boards - L2Beta
- There is also a project to replace the front-end board for the Fiber tracker which is discussed elsewhere in this report.
- A serious simulation effort to validate the operation of the hardware and internal code and to develop the experiment trigger list is in place.
- Responsibility for most of the project is at Universities. When the Saclay group could not continue its commitment to the L1Cal project, its responsibilities were taken by Michigan State. An MOU for this has been signed and the engineer at Saclay is providing the documentation needed to continue the project efficiently. Based on the experience with the CTT in Run IIa, the scope of the modifications to the Digital Front-end in the L1CTT project has been expanded to allow improved debugging and monitoring capability. This change has also been approved and integrated into the cost and schedule.
- Although commissioning is not part of the `project`, there is a significant emphasis on preparing for a smooth and efficient change from the old to the new. Infrastructure is planned to be in place to allow the testing and integration of new boards with live signals while continuing to run the experiment, and the trigger upgrade installation leader has the attention of his colleagues. Discussions are starting with Fermilab for people to install some of this infrastructure.

- The Trigger Upgrade was approved in 2002 and was rebaselined in January 2004. The experiment has a working schedule which shows completion of L1 hardware production and testing on 7/5/05, the L2STT h-p & t on 3/30/05 and the L2 Beta h-p & t on 1/24/05. (It is understood that this does not mean this hardware is installed in the experiment at the above dates)
- The date and duration of any accelerator shutdown at the end of FY05 is not known.

Comments:

- This reviewer was very impressed with the presentations and the work described. University physicists from the L1cal, L1caltrack, Simulation tasks and the two Level 2 managers were present.
- The L1cal and L1CTT projects are vital to the experiment. The ADF v2 board (the L1cal front-end) seems to be the most challenging design and has yet to be validated. I'm sure its progress will be watched carefully. If there are other production issues, they were not obvious.
- There seemed to be confidence in the adequacy of engineering resources for the trigger upgrade - both at Universities and at Fermilab. There does not seem to be a big risk of major schedule slips on the production and testing part of this work. It will be useful to check this statement in November (04).
- The SC-IPC, (Standing Committee on Upgrade Installation-to-Physics Commissioning) has been established by the spokespeople with the charge to provide an estimate of the time and effort to bring the detector with its new trigger and front-end systems to physics quality data. This is an issue for the experiment management and it will be good for the experiment to understand the size of the effort required. There may be advantages in introducing people into the commissioning effort sooner rather than later.
- Concern was expressed about the availability of Fermilab physicists for commissioning the CTT.
- The online upgrade is well understood and well planned; it was satisfying to see the work being done early in the process.

Recommendations:

1. Secure the manpower for all installation needed in the 2004 shutdown to allow testing during the data taking of FY05.
2. Establish a forum (presumably through the Director for Research) for ongoing dialog with CDF and the Accelerator Division on the timing of the FY05 shutdown (maybe this exists already).
3. It would be helpful to have a presentation on the trigger simulation and validation efforts some time in early 2005.

4. It would be useful to have a presentation of the SC-IPC task list around the same time.

3.0 Silicon Layer 0 Status and Installation

- It is clear that there is a very strong and experienced team in place for the project. The effort also benefits from all of the work done on and resources and experience acquired by the original, full detector replacement project. It is also clear that there is a well-defined plan for the construction of the Layer 0 detector and its integration with the existing vertex detector. The project also showed that, at least for now, the component costs are under budget. All of these observations are findings on my part. Having said this, though, it should be pointed out that the project faces three major technical challenges:
 1. Building, testing, and delivering a system in time for a shutdown that is tentatively scheduled to begin about 14 months from now.
 2. Fitting the Layer 0 detector within an existing aperture, where the clearance is understood to be as tight as .8 millimeters in certain locations.
 3. Avoiding coherent noise problems associated with couplings, within the new system, to the sensor ac strips and analog cable lines, and possible couplings to the beam pipe and the existing detector. This is a serious worry as coherent noise could potentially render the entire system unusable or require a long time and intensive effort to develop off-line algorithms to remove the common noise.
- With regards to module design and assembly the project has done a good job in building prototype modules (albeit not with the final components) and demonstrating low noise and otherwise fine operational parameters. It is unfortunate that the final design (bare) hybrids did not arrive in time for the review, but they are due around mid-August. My only recommendation would be to follow up on the promised delivery, understand now if vendor is experiencing any problems, and have a team in place to wipe, probe, stuff, bond, and thoroughly test completed hybrids in late August/early September. The project leaders are all too aware that hybrid deliveries and hybrid quality issues are invariably the pacing items on silicon detector projects.
- The project raised concerns about the availability of key SiDet personnel for the module construction phase. This is indeed a valid concern as there is (or was at the time of the review) uncertainty over which SiDet technicians would be drafted into the shutdown effort. Unfortunately technicians at SiDet tend to be viewed as pool resources and thus their efforts have lower priority, in some sense, than those of technicians directly assigned to the Collider experiments. My recommendation would be for the project leaders to meet at SiDet with the PPD management, perhaps after the change in Division head, and to provide some introduction to the project and indicate what resources, including any key personnel, are needed for the construction effort. The

project should take care to also include technician effort needed for support activities, such as modifying fixtures and building and assembling mock-ups.

- From the presentations and follow-up discussions it is not clear to me how confident the project is in the aperture clearance for Layer 0 even with the proposed changes to reduce the profile of the detector. My personal instinct would be to remove and ‘refurbish’ the H-disk detectors during the upcoming shutdown period and to inspect the aperture, perhaps with a boroscope, during the H-disk work. I would do this even in the absence of key personnel from Moscow State University. This would have the advantage of getting the H-disk work out of the way and, more importantly, assuring the project that there are no unknown restrictions within the 2.4 meter installation region. There is some risk to rest of the vertex detector with any of this work, and the D0 collaboration would need to approve the operation. Also, I would not make this recommendation if the project leaders felt that it would sap resources that are needed for the module construction effort.
- With the assistance of Marvin Johnson and others the project has done a good job in reducing pick-up noise effects of the type that plagued, and continue to plague, the CDF Layer 00 detector. Still, in order to understand and mitigate any remaining operational or coherent noise issues it is important that the completed detector be operated at SiDet for a period of at least 6-8 weeks. I would hope that there would be enough flexibility in the Lab’s schedule that the start of the shutdown could even be delayed if necessary to accommodate this integration study.
- The one week allotted between “L0 Silicon Cable-up Complete” and “Silicon Ready for Resumption of Tevatron Operation” seems to me to be a bit on the short side. However, it is difficult to scale from experiences on much larger silicon detector installation efforts to a single layer, 48 module system. I would recommend that as the time of the L0 installation shut-down draws near, the Project refines its timeline for the installation and technical commissioning based upon a firmer understanding of what the work will actually entail. The timeline should ideally be independent of any pre-conception as to the length of the shutdown.
- One last suggestion, and one that is outside the scope of this review: For oversight and accounting purposes the upgrade project ends with the completed detector ready for delivery to DAB. However, I think that the D0 should view installation, commissioning – both technical and physics, and maintenance as an interconnected process. In some ways it would be better if the installation of the Layer 0 detector was viewed as the *beginning* of a process. I would further hope that there be some continuity between the construction and commissioning efforts and that the commissioning team is as richly layered as is the current construction team. Finally, it is important for the D0 collaboration to give both support and prominence to the commissioning effort. These comments are made in light of a previous experience where the process did not go as smoothly as one would have wanted.

4.0 AFEII Status and Plans

Findings

- The experiment presented evidence that the current AFE will have problems at “high” luminosity ($1.2E32 = 30\%$ occupancy in Layer 1 for jet triggers.)
- AFE problems can affect track reconstruction efficiency and reconstruction time.
 - SVX2 allows only 1 threshold per 64 channels; threshold must be set too high for many channels & too low for others... characterized by the group as equivalent to an additional 0.5pe of noise.
 - Tick-to-tick variation of SVX2 pedestal effectively adds ~ 0.5 pe of noise.
 - Offline cuts necessary to suppress noise typically increase the effective discrimination threshold (to allow a hit to be used in tracks) by an additional ~ 1.5 -2 pe.
 - Rate dependent effects are already beginning to be noticeable.
- A chip (TriP) designed to replace the SIFT & SVX2e on the AFE boards has been designed, fabricated in production quantity, and tested.
 - Modified MCM's with TriP perform well on AFE boards.
 - The chip meets specifications.
- A prototype AFEII pcb is nearing completion.
 - Designed to use TriP without an MCM.
 - Other functionality is added to allow calibration in the abort gaps, reduce deadtime, and increase L1 readout rate.
- An enhanced TriP chip (TriPt), including an analog encoded time measurement, is being designed.
 - First submission is expected on August 23.
 - Will require a modified AFEII pcb.
- Base cost of AFEII with TriPt = \$1.47M (contingency = \$0.7M).
- Of the base, TriPt production cost \sim \$0.3M M&S.
- TriPt production submission projected for 3/05.
 - TriPt production is the critical path for the sub-project as presented.
- AFEII milestones project a decision on the project in 2/05.
- First board installation is projected for 2/06, after the 2005 shutdown.
- Installation is expected to proceed a crate at a time, as allowed by AFEII production and opportunities for Tevatron access.

Comments

- We believe that replacing the AFE boards is an appropriate approach to mitigating the current and anticipated problems, and that this deserves serious consideration.
- It was not straightforward for the committee to assess the utility of the timing measurement proposed for TriPt.
 - The simulation that has been performed uses a single 25cm resolution function for all hits.
 - The resolution will certainly vary from region to region in the chamber and may not be as good as assumed (the proponents said 30cm in this review).
 - A large software effort will be required to try to utilize the time information.
- This project has relied on, and expects to continue to rely on, a few key people.
 - The availability of these people has not yet been ensured.

Recommendation

1. The committee feels that the collaboration should carefully consider their strategy, including when to make the decision whether or not to proceed with an AFE replacement.

5.0 Installation and Commissioning for 2004 & 2005

Findings

- The D0 RunIIb installation activities stretches over two Tevatron shutdowns in Fall '04 and Fall '05. Installation activities in '04 include some Trigger work and preparation for the L0 Silicon installation in '05. Installation activities in '05 are driven mostly by the L0 Installation. In-between-shutdowns installation activities are focused mostly on preparation for the L0 installation and debugging of Trigger electronics in the sidewalk.
- The “Installation” activity is off-project (non MIE-funded). As such, no direct funding is provided to the Installation, but rather the L1 and L2 Installation Managers have responsibility for securing manpower resources and direct them to the D0 Installation task.
- A bottom-up schedule exists. The time estimates are provided by the people expected to perform the work, based on the RunIIa experience. The schedule foresees a 7 weeks shutdown in FY05.
- A cost estimate for the installation exists. A total cost of 1522 k\$ is presented (1428 k\$ in manpower, ~400k\$ going to universities, and 98k\$ in M&S). An estimated uncertainty of ~708 k\$ is associated with this estimate.

Comments

- The Technicians (“hands-on labor”) cost during the installation phase amounts to ~100k\$ (Elec. Techs + Mech. Techs). This is only ~10% of the total manpower cost during installation which is perceived by at least a member of the committee as insufficient. On the other hand large amounts of “hands-on labor” will be provided by physicists and engineers (either paid by the Installation phase or invited from collaborating institutions). The involvement and commitment of these external resources for the Installation should be documented explicitly in the existing SOW-MOU with the Collaborating Universities.
- Apart from some conceptual design work performed at University of Washington, no further development is in progress on the front of tooling and procedures development for the insertion of L0. An appropriate person is already identified but not working on the issue yet.
- The manpower cost appears slightly underestimated (this is the usual wasp-nest about charge-back rates, SWF, etc.). Example: the D0 Installation claims they will need ~52 months of FTE mechanical technicians (corresponding to 2 FTE working for 2 years) and they cost the effort at ~100 k\$. A review of the manpower cost could be useful.
- Apart from physicists, none of the manpower is secured inside PPD. Some manpower (CompProf) is expected from outside-PPD sources. D0 RunIIb Management should be proactive in identifying resources and converging on agreements outside the boundaries of the D0 Collaboration.

- The L0 Silicon successful installation depends strongly on the beginning and duration of the '05 shutdown.

Recommendations

1. Include in the '04 shutdown the activities of L0 surveying (unless risks exceed paybacks). Perform a risk analysis for the L0 '05 installation and preliminary engineering assessment by January '05.
2. Proactively approach the PPD Division Management and the Directorate to coordinate usage of manpower resources during the '04 and '05 shutdowns.
3. Reevaluate the M&S Installation Cost estimate after the survey performed during shutdown '04. (To Directorate) Consider transferring the control of M&S funds for Installation from Operations to MIE Project.
4. Initiate communication with CDF and AD for shutdown '05 duration.

6.0 Cost

Findings

- After re-baselining the total MIE funding is \$9,960M, of which approximately \$1.8 M is for university work
- Total MRI funding from the start of the project is \$3,068M
- The contingency for remaining MIE funded Work excluding estimated AFEII cost and its contingency is estimated at 77%.
- Performance Cost Management Indicators are being used by the project on a monthly basis

Comment

None

Recommendation

1. Performance management indicators do not consistently reflect actual costs for the work that has been completed. The area with the largest discrepancies is for work being done at the universities for which invoices have not been received. More effort should be put into getting estimated expenditures from the universities so the costs can be more accurately estimated and accrued, so a more detailed analysis of the cost variances can be performed to determine if corrective actions are required.

7.0 Schedule

Finding

- Resource loaded MSP schedules exist and are being statused on a monthly basis.

Comment

- Costs for Fermilab work appears to be well understood by the Project Management. The cost of non-Fermilab work is not as well understood. In any case it appears that sufficient contingencies are still available for the remaining work.

Recommendation

1. Pitch Adapters for Layer 0 Silicon Detector were not part of original scope and have been added to the work, are in the prototype state and are being paid on MRI funds. This scope of work was not added via a Change Request and not added to the schedule. Currently there are issues in the prototype phase. This additional scope could have impact on the schedule for Layer 0. The Pitch Adapter should be added to the project scope via the Change Control process and then added into the project schedule.
2. Layer 0 has “Ready to Move” milestone with a baseline schedule milestone of 5/25/06 an aggressive schedule date of 7/21/05. Layer 0 Management forecasts an approximate 2 months earlier completion date, but they have not modifying the aggressive/working schedule. The aggressive/working schedule should be modified to reflect the current forecast for work completion.
3. The four DOE Level 1 Milestones in the PEP have the same completion dates for the equivalent Level II Directorate's Milestones, which does not allow any contingency between the milestones. To minimize the risk of the Level 1 milestone dates being missed, a heightened level of awareness needs to be adopted for these four milestones. This can be addressed by emphasizing these milestones separately in the Project's Monthly Report. Additionally, the Directorate should assess whether or not the dates of the equivalent Level 2 Directorate Milestones should be modified to allow float between the Level 1 and Level 2 milestones.

Schedule

Level 1 Milestone #	Level 2 Milestone #	Description	Level 1 Milestone Date	Level 2 Directors Milestone Date
D-Zero 1.2	2.18	Online System Production and Testing Complete	October 2005	10/7/05
D-Zero 1.3	2.15	Level 2 Trigger Production and Testing Complete	January 2006	1/5/06
D-Zero 1.4	2.17	Level 1 Trigger Production and Testing Complete	April 2006	4/10/06
D-Zero 1.5	2.10	Silicon Ready to Move to D-Zero	May 2006	5/25/06

4. There were several examples of variances between the current working schedule and how work will be performed. There are concerns from the project management that the effort to update the schedules and costing tool for the smaller changes could be difficult with the present level of project office support. The Project Manger should address this concern as soon as possible.

8.0 Management

Findings

- The Management group is performing well on ***Project Integration Management*** (Process needed to insure all elements of project are properly coordinated, including the Project Management Plan and Change Control process)
- The Management group is performing well on ***Project Scope Management*** (Process required to ensure that the project include all the work required and only the work required to complete the project. The scope planning and defined, scope verification is easy, D0 Management has the next hurdle in scope change control (AFEII) if the inclusion of this new scope will be deemed necessary through physics motivations.)
- The Management group is performing adequately on ***Project Time Management*** (Process required to insure timely completion of project. All activities are defined (kudos for the installation tasks definition) sequencing in place, duration estimating done with people performing the work, the schedule is developed and under control).

Recommendations

1. Resolve the issues about DOE Headquarters/DOE Field Office/Directorate milestones.
2. Include all tasks (ex: pitch adapter) in the project schedule.

Findings

- The Management group is performing adequately on ***Project Cost Management*** (Process required to insure project completion within approved budget including resource planning, cost estimating, budgeting, cost control) with the exclusion of some gray areas on the Installation front.
- The management group is performing adequately on ***Project Quality Management*** (Process required to insure the project will satisfy the needs for which it was undertaken). In particular the Trigger and DAQ will be extensively tested before physics on, the L0 Silicon discussed a plan of system testing after L0 completion and before installation.

Recommendation

1. Formalize the L0 Silicon testing plan after May '05 (end of production) and before the '05 shutdown.

Finding

- The Management group has some work to do on ***Project Human Resources Management*** (Process required to make the most effective use of people

involved, including Organizational planning, staff acquisition, team development, etc.) both for Project and Installation activities.

Recommendations

1. Initiate communications with Division Heads and Directorate to obtain manpower resources in an appropriate manner.
2. Insure availability of key personnel at SIDET for the L0 Assembly during the '04 shutdown.

Finding

- The management group has some work to do on ***Project Communication Management*** (Process required to insure timely and appropriate generation, collection, dissemination, storage and disposition of project information).

Comment

- Improve performance reporting at the Project Office level, off-loading acquisition of project related information to the Project Office personnel.

The Management group has some work to do on ***Project risk Management*** (Process concerned with identification, analysis and response to project risks). Installation of the L0 Silicon detector is presently perceived as the major risk.

Recommendation

1. Present a plan for the assessment and analysis of the risks connected with the L0 Installation.

The Management group has performed well on ***Project Procurement Management*** (Process required to acquire goods, including planning, solicitations, source selection, contract administration, close-out)

Appendix A

Charge for the July 2004 Director's Review Of the D-Zero Run IIb Detector Upgrade

Please arrange and conduct a Director's Review of the D-Zero Run IIb Detector Upgrade project. It has been many months since the last Director's Review of this project. Therefore, assessing progress to date by the Project Team is one of the charge items. An assessment of progress on the Layer 0 Silicon is of particular interest. Some installation will take place over the Summer / Fall 2004 shutdown. Please examine these installation plans carefully. The AFEII system has not yet been made part of the Run IIb Upgrade baseline. Please assess the status and plans for this system. Finally, although installation of the upgrade is "off project," please examine the plans for the 2005 installation activities and comment on D-Zero cost estimates for these activities. This review should as has become traditional cover the technical, cost, schedule and management aspects of the project.

Please present the Committee findings, comments, and recommendations in a closeout meeting with the D-Zero Run IIb Upgrade Project Team and Fermilab management and provide a written report within two weeks.

Appendix B

**Agenda for the Director's Review of the
D-Zero Run IIb Detector Upgrade
(July 15-16, 2004)
The Racetrack – 7N Crossover**

Thursday, July 15, 2004

8:30-9:00	Executive Session	E. Temple
9:00-9:30	Introduction and Project Manager's Overview	V. O'Dell
9:30-10:00	Trigger Status	B. P. Padley
10:00-10:30	Trigger Installation / Commissioning Plans	D. Wood
10:30-10:45	BREAK	
10:45-11:15	Silicon Layer 0 Status	A. Bean
11:15-11:45	Silicon L0 Installation / Commissioning Plans	R. Lipton
11:45-1:00	LUNCH	
1:00-1:20	Online Upgrade status and plans	S. Fuess
1:20-11:50	AFEII Status and Plans	A. Bross
1:50-2:20	Overall Installation / Commissioning for 2004 & 2005	R. Smith
2:20-4:00	Breakout Sessions	
	1-Installation and Commissioning (Racetrack)	
	2-Other as needed eg Trigger or AFEII (Comitium)	
4:00	Executive Session	E. Temple

Friday, July 16, 2004 - Comitium

8:00-9:00	Follow-up Discussions with DZero Team as needed
9:00	Write Report
11:00	Closeout Dry Run
12:00	LUNCH
1:00	Closeout

Appendix C**Director's Review of DZero Run IIb Detector Upgrade
July 15-16, 2004****Review Committee**

Giorgio Apollinari
Fermilab
P.O. Box 500
MS 316
Batavia, IL 60510
apollina@fnal.gov

Lenny Spiegel
Fermilab
P.O. Box 500
MS 205
Batavia, IL 60510
lenny@fnal.gov

David Christian
Fermilab
P.O. Box 500
MS 122
Batavia, IL 60510
dcc@fnal.gov

Ed Temple
Fermilab
P.O. Box 500
MS 200
Batavia, IL 60510
temple@fnal.gov

Dean Hoffer
Fermilab
P.O. Box 500
MS 200
Batavia, IL 60510
dhoffer@fnal.gov

William Wester
Fermilab
P.O. Box 500
MS 222
Batavia, IL 60510
wester@fnal.gov

Stephen Pordes
Fermilab
P.O. Box 500
MS 308
Batavia, IL 60510
stephen@fnal.gov

**Tentative Reviewer Assignments for July 15-16-2004 DZero
Directors Review**

Trigger Status and Installation Plans	Stephen Pordes
Silicon Layer 0 Status	Lenny Spiegel
AFEII Status and Plans	William Wester, Dave Christian
Installation and Commissioning for 2004 & 2005	Giorgio Apollinari
Management	Giorgio Apollinari

Appendix D

Director's Review of the DZero Run IIb Detector Upgrade July 15-16, 2004 Participants

Review Committee

G. Apollinari
D. Christian
D. Hoffer
S. Pordes
L. Spiegel
E. Temple (Chair)
W. Wester

DZero Presenters

A. Bean
A. Bross
S. Fuess
R. Lipton
V. O'Dell
B.P. Padley
R. Smith
D. Wood

Directorate

H. Montgomery
M. Witherell

DZero Collaboration

J. Kotcher

Department of Energy

Paul Philp